

THAT WHICH IS CLAIMED:

1. A method of operating a General Packet Radio Service (GPRS) wireless mobile packet data communications system, the method comprising:

5 transmitting first, second and third classes of Packet System Information (PSI) messages on a Packet Broadcast Control Channel (PBCCH) at respective first, second and third repetition rates.

2. A method according to Claim 1, wherein transmitting first, second and  
10 third classes of PSI messages on a Packet Broadcast Control Channel (PBCCH) at respective first, second and third repetition rates comprises:

periodically transmitting a sequence of messages of the first class;

transmitting successive portions of the sequence of messages of the second  
class in successive intervals between transmissions of the sequence of messages of the  
15 first class; and

transmitting a message of a third class once per an integer multiple of  
transmissions of the sequence of messages of the second class.

3. A method according to Claim 2, wherein transmitting a message of a  
20 third class once per an integer multiple of transmissions of the sequence of messages of the second class comprises transmitting a message of the third class following transmission of a final message of the sequence of messages of the second class.

4. A method according to Claim 1, wherein the PSI messages of the third  
25 class comprise Extremely Low Repetition (ELR) Payload messages including embedded information from an application layer message.

5. A method according to Claim 4, further comprising embedding a first  
portion of an application layer message in a first ELR Payload message and  
30 embedding a second portion of the application layer message in a second ELR Payload message.

6. A method according to Claim 4, further comprising embedding information from first and second application layer messages in a single ELR Payload message.

5 7. A method according to Claim 6, further comprising including an indicator of the presence of information from multiple application layer messages in the single ELR Payload message.

8. A method according to Claim 1, further comprising transmitting a  
10 schedule message on the PBCCH that indicates a schedule for transmission for messages of the third class.

9. A method according to Claim 8, wherein the PSI messages of the third class comprises ELR Payload messages comprising embedded information from  
15 application layer messages, and wherein transmitting a schedule message that indicates a schedule for transmission of messages of the third class comprises transmitting an ELR Schedule message that indicates when an ELR Payload message including information from an application layer message of interest will be transmitted.

20 10. A method of operating a wireless packet data communications system that repetitively transmits system information messages on a broadcast control channel, the method comprising:

transmitting messages on the broadcast control channel that contain embedded  
25 information from application layer messages at a lower repetition rate than that at which the system information messages are transmitted on the broadcast control channel.

11. A method according to Claim 10, wherein the messages that contain  
30 embedded information from application layer messages comprise an identifying portion formatted consistent with the system information messages and a payload portion including information from an application layer message.

12. A method according to Claim 10, wherein the system information messages comprise a first class of system information messages transmitted at a first repetition rate and a second class of system information messages transmitted at a second repetition rate that is less than the first repetition rate, and wherein  
5 transmitting messages on the broadcast control channel that contain embedded information from application layer messages at a lower repetition rate than that at which the system information messages are transmitted on the broadcast control channel comprises transmitting the messages that contain embedded information from application layer messages at a third repetition rate that is less than the second  
10 repetition rate.

13. A method according to Claim 12, wherein transmitting the messages that contain information from application layer messages at a third repetition rate that is less than the second repetition rate comprises transmitting one message that  
15 contains information from an application layer message per an integer multiple of transmissions of the sequence of system information messages of the second class.

14. A method according to Claim 13, wherein transmitting one message that contains embedded information from an application layer message per an integer  
20 multiple of transmissions of the sequence of system information messages of the second class comprises transmitting a message that contains embedded information from an application layer message following transmission of a final message of the sequence of system information messages of the second class.

15. A method according to Claim 10, wherein transmitting messages on the broadcast control channel that contain embedded information from application layer messages at a lower repetition rate than that at which the system information messages are transmitted comprises transmitting first and second messages on the broadcast control channel that contain embedded information from a single  
25  
30 application layer message.

16. A method according to Claim 10, wherein transmitting messages on the broadcast control channel that contain embedded information from application layer messages at a lower repetition rate than that at which the system information

messages are transmitted comprises transmitting a single message on the broadcast control channel that contains embedded information from first and second application layer messages.

5           17.    A method according to Claim 16, further comprising including an indicator of the presence of information from multiple application layer messages in the single message.

10           18.    A method according to Claim 10, further comprising transmitting a schedule message that indicates a schedule for transmission of the messages that contain embedded information from application layer messages.

15           19.    A method according to Claim 18, wherein transmitting a schedule message that indicates a schedule for transmission of the messages that contain embedded information from application layer messages comprises transmitting a schedule message that indicates when a message including information from an application layer message of interest will be transmitted.

20           20.    A method of operating a GPRS wireless mobile packet data communications system, the method comprising:  
            using payload messages multiplexed with Packet System Information (PSI) messages transmitted on a Packet Broadcast Control Channel (PBCCH) as transport layer messages for an application.

25           21.    A method according to Claim 20, wherein using payload messages multiplexed with Packet System Information (PSI) messages transmitted on a Packet Broadcast Control Channel (PBCCH) as transport layer messages for an application comprises transmitting the payload messages used as transport layer messages at a rate that is less than the transmission rate of Low Repetition (LR) PSI messages on  
30   the PBCCH.

            22.    A method according to Claim 21, wherein transmitting the payload messages used as transport layer messages at a rate that is less than the transmission rate of Low Repetition (LR) PSI messages on the PBCCH comprises transmitting one

message used as a transport layer message per an integer multiple cycles of transmission of the LR PSI messages.

23. A method according to Claim 20, wherein the application comprises a  
5 Location Services (LCS) application.

24. A method of operating a GPRS wireless mobile packet data communications system, the method comprising:

transmitting one Extremely Low Repetition (ELR) Packet System Information  
10 (PSI) message on a Packet Broadcast Control Channel (PBCCH) per an integer multiple cycles of transmission of Low Repetition (LR) PSI messages, such that an ELR PSI message is transmitted following transmission of a final LR PSI message of a repeatedly transmitted sequence of LR PSI messages.

25. A method according to Claim 24, wherein the ELR PSI messages are  
15 used as transport layer messages for an application.

26. A method according to Claim 25, wherein the application comprises a  
Location Services (LCS) application.

27. A method of operating a General Packet Radio Service (GPRS)  
wireless terminal, the method comprising:  
receiving first, second and third classes of Packet System Information (PSI)  
messages on a Packet Broadcast Control Channel (PBCCH) at respective first, second  
25 and third repetition rates.

28. A method according to Claim 27, wherein receiving first, second and  
third classes of Packet System Information (PSI) messages on a Packet Broadcast  
Control Channel (PBCCH) at respective first, second and third repetition rates  
30 comprises receiving a message of a third class once per an integer multiple of transmissions of the sequence of messages of the second class.

29. A method according to Claim 28, wherein receiving a message of a  
third class once per an integer multiple of transmissions of the sequence of messages

of the second class comprises receiving a message of the third class following transmission of a final message of the sequence of messages of the second class.

30. A method according to Claim 27, wherein the PSI messages of the  
5 third class comprise Extremely Low Repetition (ELR) Payload messages including embedded information from an application layer message.

31. A method according to Claim 27, further comprising receiving a  
10 schedule message on the PBCCH that indicates a schedule for reception of messages of the third class.

32. A method according to Claim 31, wherein the PSI messages of the  
15 third class comprises ELR Payload messages comprising embedded information from application layer messages, and wherein receiving a schedule message that indicates a schedule for reception of messages of the third class comprises receiving an ELR Schedule message that indicates when an ELR Payload message including information from an application layer message of interest can be received.

33. A method of operating a wireless terminal in a wireless packet data  
20 communications system that repetitively transmits system information messages on a broadcast control channel, the method comprising:

receiving messages on the broadcast control channel that contain embedded  
information from application layer messages at a lower repetition rate than that at  
which the system information messages are transmitted on the broadcast control  
25 channel.

34. A method according to Claim 33, wherein the messages that contain  
embedded information from application layer messages comprise an identifying  
portion formatted consistent with the system information messages and a payload  
30 portion including information from an application layer message.

35. A method according to Claim 33, wherein the system information  
messages comprise a first class of system information messages transmitted at a first  
repetition rate and a second class of system information messages transmitted at a

second repetition rate that is less than the first repetition rate, and wherein receiving messages on the broadcast control channel that contain embedded information from application layer messages at a lower repetition rate than that at which the system information messages are transmitted on the broadcast control channel comprises  
5 receiving the messages that contain embedded information from application layer messages at a third repetition rate that is less than the second repetition rate.

36. A method according to Claim 35, wherein receiving the messages that contain information from application layer messages at a third repetition rate that is  
10 less than the second repetition rate comprises receiving one message that contains information from an application layer message per an integer multiple of transmissions of the sequence of system information messages of the second class.

37. A method according to Claim 36, wherein receiving one message that  
15 contains embedded information from an application layer message per an integer multiple receptions of the sequence of system information messages of the second class comprises receiving a message that contains embedded information from an application layer message following transmission of a final message of the sequence of system information messages of the second class.

20 38. A method according to Claim 33, further comprising receiving a schedule message that indicates a schedule for reception of the messages that contain embedded information from application layer messages.

25 39. A method according to Claim 38, wherein receiving a schedule message that indicates a schedule for reception of the messages that contain embedded information from application layer messages comprises receiving a schedule message that indicates when a message including information from an application layer message of interest will be transmitted.

30 40. A base station of a General Packet Radio Service (GPRS) system, the base station comprising:

a transmitter operative to transmit first, second and third classes of Packet System Information (PSI) messages on a Packet Broadcast Control Channel (PBCCH) at respective first, second and third repetition rates.

5           41.     A base station according to Claim 40, wherein the transmitter is  
operative to periodically transmit a sequence of messages of the first class, to transmit  
successive portions of the sequence of messages of the second class in successive  
intervals between transmissions of the sequence of messages of the first class, and to  
transmit a message of a third class once per an integer multiple of transmissions of the  
10   sequence of messages of the second class.

          42.     A base station according to Claim 41, wherein the transmitter is  
operative to transmit a message of the third class following transmission of a final  
message of the sequence of messages of the second class.  
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          43.     A base station according to Claim 40, wherein the PSI messages of the  
third class comprise Extremely Low Repetition (ELR) Payload messages including  
embedded information from an application layer message.

20           44.     A base station according to Claim 40, wherein the transmitter is further  
operative to transmit a schedule message on the PBCCH that indicates a schedule for  
transmission for messages of the third class.

          45.     A base station for a wireless packet data communications system, the  
25   base station comprising:

          a transmitter operative to repetitively transmit system information messages  
on a broadcast control channel and to transmit messages on the broadcast control  
channel that contain embedded information from application layer messages at a  
lower repetition rate than that at which the system information messages are  
30   transmitted on the broadcast control channel.

          46.     A base station according to Claim 45, wherein the messages that  
contain embedded information from application layer messages comprise an



identifying portion formatted consistent with the system information messages and a payload portion including information from an application layer message.

47. A base station according to Claim 45, wherein the transmitter is further  
5 operative to transmit a schedule message that indicates a schedule for transmission of the messages that contain embedded information from application layer messages.

48. A General Packet Radio Service (GPRS) wireless terminal,  
comprising:  
10 a receiver operative to receive first, second and third classes of Packet System Information (PSI) messages transmitted on a Packet Broadcast Control Channel (PBCCH) at respective first, second and third repetition rates.

49. A terminal according to Claim 48, wherein the receiver is operative to  
15 receive a message of a third class that is transmitted once per an integer multiple of transmissions of the sequence of messages of the second class.

50. A terminal according to Claim 49, wherein the receiver is operative to  
20 receive a message of the third class that is transmitted following transmission of a final message of the sequence of messages of the second class.

51. A terminal according to Claim 48, wherein the PSI messages of the  
third class comprise Extremely Low Repetition (ELR) Payload messages including  
embedded information from an application layer message.

52. A terminal according to Claim 48, wherein the receiver is operative to  
receive a schedule message on the PBCCH that indicates a schedule for reception of  
messages of the third class.

53. A terminal according to Claim 52, wherein the PSI messages of the  
third class comprises ELR Payload messages comprising embedded information from  
application layer messages, and wherein the receiver is operative to receive an ELR  
Schedule message that indicates when an ELR Payload message including  
information from an application layer message of interest can be received.

54. A wireless terminal for use in a wireless packet data communications system that repetitively transmits system information messages on a broadcast control channel, the method comprising:

5 a receiver operative to receive messages on the broadcast control channel that contain embedded information from application layer messages at a lower repetition rate than that at which the system information messages are transmitted on the broadcast control channel.

10 55. A terminal according to Claim 54, wherein the messages that contain embedded information from application layer messages comprise an identifying portion formatted consistent with the system information messages and a payload portion including information from an application layer message.

15 56. A terminal according to Claim 54, wherein the system information messages comprise a first class of system information messages transmitted at a first repetition rate and a second class of system information messages transmitted at a second repetition rate that is less than the first repetition rate, and wherein the terminal is operative to receive the messages that contain embedded information from  
20 application layer messages at a third repetition rate that is less than the second repetition rate.

25 57. A terminal according to Claim 54, wherein the receiver is operative to receive a schedule message that indicates a schedule for reception of the messages that contain embedded information from application layer messages.

58. A terminal according to Claim 57, wherein the receiver is operative to receive a schedule message that indicates when a message including information from an application layer message of interest will be transmitted.

30 59. An apparatus, comprising:  
means for creating Packet System Information (PSI) messages; and  
means for causing periodic transmission of a sequence of Packet System Information (PSI) messages of a first class on a Packet Broadcast Control Channel

(PBCCH) of a General Packet Radio Service (GPRS) wireless mobile data communications system, for causing transmission of successive portions of a sequence of PSI messages of a second class on the PBCCH in successive intervals between transmissions of the sequence of PSI messages of the first class, and for  
5 causing transmission of a PSI message of a third class on the PBCCH once per an integer multiple of transmissions of the sequence of PSI messages of the second class.

60. An apparatus according to Claim 59, wherein the PSI messages of the third class comprise Extremely Low Repetition (ELR) Payload messages including  
10 embedded information from an application layer message.

61. An apparatus according to Claim 59, further comprising means for creating a schedule message that indicates a schedule for transmission for PSI messages of the third class, and for causing transmission of the schedule message on  
15 the PBCCH.

62. An apparatus according to Claim 59, wherein the means for creating Packet System Information (PSI) messages and the means for causing periodic transmission of a sequence of Packet System Information (PSI) messages of a first  
20 class on a Packet Broadcast Control Channel (PBCCH) of a General Packet Radio Service (GPRS) wireless mobile data communications system, for causing transmission of successive portions of a sequence of PSI messages of a second class on the PBCCH in successive intervals between transmissions of the sequence of PSI messages of the first class, and for causing transmission of a PSI message of a third  
25 class on the PBCCH once per an integer multiple of transmissions of the sequence of PSI messages of the second class comprises at least one of an Application Specific Integrated Circuit (ASIC) and a circuit module.

63. An apparatus, comprising:  
30 means for creating system information messages and causing the system information messages to be repetitively transmitted on a broadcast control channel of a wireless packet data communications system; and  
means for creating messages that contain embedded information from application layer messages and causing the messages that contain embedded

information from application layer messages to be transmitted on the broadcast control channel at a lower repetition rate than that at which the system information messages are transmitted on the broadcast control channel

5           64.     An apparatus according to Claim 63, wherein the messages that contain embedded information from application layer messages comprise an identifying portion formatted consistent with the system information messages and a payload portion including information from an application layer message.

10           65.     An apparatus according to Claim 63, wherein the means for creating and causing transmission of the messages that contain information from application layer messages comprises means for causing transmission of one message that contains information from an application layer message per an integer multiple of transmissions of the sequence of system information messages of the second class.

15           66.     An apparatus according to Claim 63, further comprising means for creating a schedule message that indicates a schedule for transmission of the messages that contain embedded information from application layer messages, and for causing transmission of the schedule message on the broadcast control channel.

20           67.     An apparatus according to Claim 66, wherein the means for creating and causing transmission of a schedule message comprises means for creating and causing transmission of a schedule message that indicates when a message including information from an application layer message of interest will be transmitted.

25           68.     An apparatus according to Claim 63, wherein the means for creating and causing transmission of system information messages and the means for creating and causing transmission of messages that contain embedded information from application layer messages comprise at least one of an Application Specific Integrated  
30     Circuit (ASIC) and a circuit module.

          69.     An apparatus for use in a General Packet Radio Service (GPRS) wireless mobile data communications system, the apparatus comprising:

means for receiving a sequence of Packet System Information (PSI) messages of the first class periodically transmitted on a Packet Broadcast Control Channel (PBCCH);

5 means for receiving PSI messages of a second class on the PBCCH transmitted in portions in successive intervals between transmissions of the sequence of PSI messages of the first class; and

means for receiving a PSI message of a third class on the PBCCH transmitted once per an integer multiple of transmissions of the sequence of PSI messages of the second class.

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70. An apparatus according to Claim 69, wherein the PSI messages of the third class comprise Extremely Low Repetition (ELR) Payload messages including embedded information from an application layer message.

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71. An apparatus according to Claim 69, further comprising means for receiving a schedule message on the PBCCH that indicates a schedule for transmission for PSI messages of the third class.

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72. An apparatus according to Claim 69, wherein the means for receiving a sequence of Packet System Information (PSI) messages of a first class, the means for receiving a sequence of PSI messages of a second class, and the means for receiving a PSI message of a third class comprises at least one of an Application Specific Integrated Circuit (ASIC) and a circuit module.

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73. An apparatus, comprising:

means for receiving system information messages transmitted on a broadcast control channel of a wireless packet data communications system; and

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means for receiving messages on the broadcast control channel that contain embedded information from application layer messages and that are transmitted at a lower repetition rate than that at which the system information messages are transmitted on the broadcast control channel.

74. An apparatus according to Claim 73, wherein the messages that contain embedded information from application layer messages comprise an

identifying portion formatted consistent with the system information messages and a payload portion including information from an application layer message.

75. An apparatus according to Claim 73, wherein the means for receiving  
5 messages on the broadcast control channel that contain information from application layer messages comprises means for receiving one message that contains information from an application layer message per an integer multiple of transmissions of the sequence of system information messages of the second class.

10 76. An apparatus according to Claim 73, further comprising means for receiving a schedule message that indicates a schedule for transmission of the messages that contain embedded information from application layer messages.

77. An apparatus according to Claim 76, wherein the means for receiving a  
15 schedule message comprises means for receiving a schedule message that indicates when a message including information from an application layer message of interest will be transmitted.

20 78. An apparatus according to Claim 73, wherein the means for receiving system information messages and the means for receiving messages on the broadcast control channel that contain embedded information from application layer messages comprise at least one of an Application Specific Integrated Circuit (ASIC) and a circuit module.

25 79. A computer program product comprising computer-readable program code embodied in a computer-readable program storage medium, the computer-readable program code comprising:

program code for causing periodic transmission of a sequence of Packet  
System Information (PSI) messages of a first class on a Packet Broadcast Control  
30 Channel (PBCCH) of a General Packet Radio Service (GPRS) wireless mobile data communications system;

means for causing transmission of successive portions of a sequence of PSI  
messages of a second class on the PBCCH in successive intervals between  
transmissions of the sequence of PSI messages of the first class; and

means for causing transmission of a PSI message of a third class on the PBCCH once per an integer multiple of transmissions of the sequence of PSI messages of the second class.

5           80.     A computer program product according to Claim 79, wherein the PSI messages of the third class comprise Extremely Low Repetition (ELR) Payload messages including embedded information from an application layer message.

10           81.     A computer program product according to Claim 79, further comprising program code for causing transmission of a schedule message on the PBCCH that indicates a schedule for transmission for PSI messages of the third class.

15           82.     A computer program product comprising computer-readable program code embodied in a computer-readable program storage medium, the computer-readable program code comprising:

            program code for causing repetitive transmission of system information messages on a broadcast control channel of a wireless packet data communications system; and

20                     program code for causing transmission of messages on the broadcast control channel that contain embedded information from application layer messages at a lower repetition rate than that at which the system information messages are transmitted on the broadcast control channel.

25           83.     A computer program product according to Claim 82, wherein the messages that contain embedded information from application layer messages comprise an identifying portion formatted consistent with the system information messages and a payload portion including information from an application layer message.

30           84.     A computer program product according to Claim 82, further comprising program code for causing transmission of a schedule message that indicates a schedule for transmission of the messages that contain embedded information from application layer messages.

85. A computer program product comprising computer-readable program code embodied in a computer-readable program storage medium, the computer-readable program code comprising:

- program code for receiving a sequence of Packet System Information (PSI) messages of a first class periodically transmitted on a Packet Broadcast Control Channel (PBCCH) of a General Packet Radio Service (GPRS) wireless mobile data communications system;
- program code for receiving a sequence of PSI messages of a second class that are transmitted on the PBCCH that are transmitted in successive intervals between transmissions of the sequence of PSI messages of the first class; and
- means for receiving a PSI message of a third class on the PBCCH that is transmitted once per an integer multiple of transmissions of the sequence of PSI messages of the second class.

86. A computer program product according to Claim 85, wherein the PSI messages of the third class comprise Extremely Low Repetition (ELR) Payload messages including embedded information from an application layer message.

87. A computer program product according to Claim 85, further comprising program code for receiving a schedule message on the PBCCH that indicates a schedule for transmission for PSI messages of the third class.

88. A computer program product comprising computer-readable program code embodied in a computer-readable program storage medium, the computer-readable program code comprising:

- program code for receiving system information messages repetitively transmitted on a broadcast control channel of a wireless packet data communications system; and
- program code for receiving messages on the broadcast control channel that contain embedded information from application layer messages and that are transmitted at a lower repetition rate than that at which the system information messages are transmitted on the broadcast control channel.



89. A computer program product according to Claim 88, wherein the messages that contain embedded information from application layer messages comprise an identifying portion formatted consistent with the system information messages and a payload portion including information from an application layer message.

90. A computer program product according to Claim 88, further comprising program code for receiving a schedule message that indicates a schedule for transmission of the messages that contain embedded information from application layer messages.